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SECRETARY OF THE AIR FORCE**

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Flying Operations

U-2 OPERATIONS PROCEDURES

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This instruction implements AFPD 11-4, *Aviation Service*; AFI 11-200, *Aircrew Training, Standardization/Evaluation, and General Operations Structure*; and AFI 11-202V3, *General Flight Rules*. It prescribes standard operational procedures for use by pilots who operate USAF U-2 aircraft. It does not apply to Air National Guard (ANG) or Air Force Reserve Command (AFRC) units or members. Major Commands (MAJCOMs)/Direct Reporting Units (DRUs)/Field Operating Agencies (FOAs) are to forward proposed MAJCOM/DRU/FOA-level supplements to this volume to AF/A3O-AI, through ACC/A3MH, for approval prior to publication in accordance with (IAW) AFI 11-200. **NOTE:** The terms DRU and FOA as used in this paragraph refer only to those DRUs/FOAs that report directly to HQ AF. Keep supplements current by complying with AFI 33-360, *Publications and Forms Management*. See [paragraph 1.3](#) of this volume for guidance on submitting comments and suggested improvements to this publication. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363 *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule (RDS) maintained in the Air Force Records Information Management System (AFRIMS) located at <https://www.my.af.mil/afirms/afirms/afirms/rims.cfm>. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847s from the field through the appropriate functional's chain of command.

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Public Law 93-294 (Aviation Career Incentive Act of 1974); *Executive Order 9397* (SSN), as amended by *Executive Order 13478*, *DOD Directive 7730.57*, *Aviation Career Incentive Act and Required Annual Report*; *Air Force Instruction 11-401*, *Aviation Management*; and *Executive Orders 9397 and 13478*. System of records notice F011 AF XO A, Aviation Resource Management System (ARMS) applies and is available at <http://privacy.defense.gov/notices/usaf/>. The reporting requirements in this instruction are exempt from licensing IAW AFI 33-324, *The Information Collections and Reports Management Program; Controlling Internal, Public, and Intra-agency Air Force Information Collections*. In accordance with the Paperwork Reduction Act and DoD policy, ensure that reports of information collections that are collected and/or compiled and transmitted from the general public are cleared and licensed by the Office of Management and Budget prior to collection. Information that is collected from other DoD components or Federal agencies must be approved by DoD and license with a report control symbol.

SUMMARY OF CHANGES

Corrects publication format IAW the latest release of AFI 33-360. Incorporates requirements of AFI 11-200. Corrects OPR references throughout the document, due to changes in ACC office symbols. Corrects AFI references throughout the document. Adds operational risk management considerations in **paragraph 2.4.1** to match final AF-approved recommendations from a previous Class A mishap. Adds reference to data link and electronic warfare system operations in **paragraph 2.5.4**. Adds space weather planning factors, guidance and restrictions **paragraph 6.7**. Clarifies post-flight recovery period guidance in **paragraphs 7.2.5** and **7.2.7**, and **Table 7.1**. Updates crew rest considerations and commander responsibilities in **paragraph 7.5**. Adds deployment timing guidance in **paragraph 7.9**. Updates references, acronyms and abbreviations, and definitions in **Attachment 1**.

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Chapter 1

INTRODUCTION

1.1. General:

1.1.1. Abbreviations, acronyms and terms. See [Attachment 1](#).

1.1.2. In conjunction with other governing directives, this volume prescribes procedures for U-2 aircraft under most circumstances, but it is not a substitute for sound judgment. This volume provides guidelines for U-2 aircraft operations and applies to U-2 aircrews and all management levels concerned with operation of the U-2 aircraft. It is a compilation of information from aircraft flight manuals, flight information publications (FLIP), and Air Force directives, as well as an original source document for many areas. Basic source directives have precedence in the case of any conflicts, revisions, and matters of interpretation.

1.1.3. Copies will be current and available to planning staffs from headquarters to aircrew level.

1.2. Deviations and Waivers:

1.2.1. Deviations. Do not deviate from the policies and guidance in this volume under normal circumstances with the following exceptions:

1.2.1.1. If an urgent requirement or aircraft emergency dictates otherwise, in which case the pilot in command, or instructor, will take the appropriate action to safely recover the aircraft.

1.2.1.2. When a controlling source publication changes, that publication takes precedence until the change is incorporated herein. After a change is made to a controlling source, a change to this volume will be distributed in a timely manner.

1.2.2. Waivers. Waiver authority is the parent MAJCOM/A3 unless otherwise directed in this volume. If appropriate, waiver approval and coordination should be published in the mission or theater concept of operations (CONOPS).

1.3. Revisions. Submit proposed changes to this volume through appropriate channels to HQ ACC/A3MH according to AFI 11-215, *USAF Flight Manuals Program (FMP)*. Use AF Form 847, *Recommendation for Change of Publication*. HQ AF/A3/5 is the approval authority for interim changes (IC) and revisions to this instruction.

1.4. Key Words and Definitions.

1.4.1. "Will" and "shall" indicate a mandatory requirement.

1.4.2. "Should" is normally used to indicate a preferred, but not mandatory, method of accomplishment.

1.4.3. "May" indicates an acceptable or suggested means of accomplishment.

1.4.4. "Note" indicates operating procedures, techniques, etc., considered essential to emphasize.

Chapter 2

MISSION PLANNING

2.1. Flight Manuals. All U-2 pilots will be provided access to electronic flight manuals and are personally responsible for maintaining knowledge of flight manual procedures.

2.2. Checklists. Each crewmember will have and refer to appropriate checklists during flight operations to ensure accomplishing required actions.

2.3. Local Aircrew Aids. Locally developed aircrew aids, to include those which combine steps from the 1U-2S-1CL-1 and 1U-2S-1CL-2, are authorized.

2.4. Mission Planning Responsibility. The mission pilot is ultimately responsible for proper mission planning.

2.4.1. Commanders will employ Operational Risk Management (ORM) principles to ensure that operations do not exceed established risk levels. ORM assessments will consider changes/disruptions in pilot circadian rhythm, fatigue assessment and fatigue countermeasures (i.e. nutritional support, pharmaceutical support, adaptation and conditioning).

2.4.2. Commanders will ensure all mission planning materials are current and command guidance is followed. Squadron and Forward Operating Location (FOL) operations officers will ensure adequate mission planning time is scheduled prior to flight.

2.4.3. For operational reconnaissance and Higher Headquarters (HHQ) directed sorties, responsibility for determining mission objectives, sensor selection, route of flight, country clearances, etc., is shared between operations and intelligence functions at the wing level or above. HHQ missions include deployment, redeployment, reconnaissance operations, Operational Readiness Inspections (ORI), and Programmed Depot Maintenance (PDM) input/output. Exercise missions flown in support of higher headquarters directed exercises, (e.g. RED FLAG) and exercise support to classified users are also considered HHQ missions.

2.5. Mission Planning Procedures. Mission planning must be sufficient to ensure safe and successful mission accomplishment. Areas covered will include, at a minimum, fuel requirements, chart preparation, mission objectives, threat study (when applicable), departure and arrival procedures, and communication procedures.

2.5.1. Map/Chart Preparation. All mission materials (other than FLIP) will be placed on boards to ease handling in the pressure suit. Annotate restricted/prohibited areas, route of flight, and emergency airfields along the route of flight. Known threats to the U-2 will be depicted.

2.5.2. Pre-flight Briefings. Pilots are responsible for briefing the mobile officer prior to each flight. For all flights, the briefing will include:

2.5.2.1. Emergency airspeeds for use immediately after takeoff and the assistance desired from the mobile officer.

2.5.2.2. Visual Search Responsibilities:

2.5.2.2.1. Departure/Enroute/Recovery.

- 2.5.2.2.2. High Density Traffic Areas.
- 2.5.2.3. Mid-Air Collision Avoidance from:
 - 2.5.2.3.1. Other military aircraft.
 - 2.5.2.3.2. Civilian aircraft.
- 2.5.3. Training Flights. Do not accomplish any simulated emergencies without pre-briefing the mobile.
- 2.5.4. High Altitude Training Flights and Operational Missions. Pre-flight briefings will include:
 - 2.5.4.1. Mission objectives
 - 2.5.4.2. Sensor/data link/electronic warfare system (EWS) operation (if configured)
 - 2.5.4.3. Recovery plan
 - 2.5.4.4. Airfield ground movement.
 - 2.5.4.5. High Flight Fuel Reserve Requirements. At Beale AFB, high flight missions will be planned to arrive at the initial approach fix (IAF) with the AFI 11-202V3, *General Flight Rules* fuel reserve OR the following fuel reserve, **whichever is higher**:
 - 2.5.4.5.1. Training – 425 gallons
 - 2.5.4.5.2. HHQ Directed – 200 gallons

2.6. Flight Crew Information File (FCIF) Procedures. Mobiles and pilots will review FCIF Volume 1, Parts B and C, before all missions or ground aircrew duties and update the FCIF currency record.

Chapter 3

NORMAL OPERATING PROCEDURES

3.1. Preflight:

3.1.1. General. The pilot will review the aircraft forms, including weight and balance. The pilot is responsible for knowing the aircraft condition prior to acceptance for flight.

3.1.2. Low Flights. The pilot will normally accomplish the aircraft preflight, to include the exterior inspection. The mobile officer may perform the exterior inspection if conditions warrant.

3.1.3. High Flights. The mobile officer will normally perform the interior inspection to include checking inertial navigation system (INS) destination points/emergency airfields/bulls eyes. The mobile officer will also normally review the aircraft forms and perform the exterior inspection.

3.2. Ground Visual Signals:

3.2.1. For engine start and ground operations prior to taxi, the pilot will normally be in contact with the crew chief via intercom. If the intercom is inoperative, the pilot may elect to use visual signals.

3.2.2. Establish radio contact with the mobile officer prior to engine start (N/A for communication-out launches).

3.3. Taxi:

3.3.1. Taxi only after receiving "ground crew clear" from the mobile officer via radio transmission or visual signal.

3.3.2. If unable to make a turn, stop; then follow the mobile officer's instructions for pushing the aircraft. Close coordination with the mobile officer is necessary to push an aircraft safely. Do not actuate control surfaces, run up the engine, or roll forward until cleared by the mobile officer.

3.3.3. Do not taxi with a wing tip contacting the runway or taxiway when EWS wing tip receivers are installed.

3.4. Runway Line Up:

3.4.1. Intersection Takeoffs. Avoid performing intersection takeoffs if the stopping distance is critical and using the entire runway is operationally feasible. On training sorties do not perform intersection takeoffs if the takeoff ground distance and abort stopping distance exceed the available runway remaining.

3.4.2. Locations with Crowned Runways. Do not line up on runway centerline with fuel loads less than R-6 unless operationally necessary. The pogo(s) may fall out on crowned runways when the pins are removed.

3.4.3. Takeoffs Without One or Both Pogos.

3.4.3.1. For training missions, a hand launch is permissible at light fuel loads (R-3 or less). At least one pogo is required at fuel weights above R-3.

3.4.3.2. For operational and higher headquarters missions, hand launches are at the discretion of the squadron or FOL commander.

3.4.4. Before Takeoff Checks. Do not run-up power until receiving takeoff clearance and getting a "thumbs up" or verbal "ground crew clear" from the mobile officer.

3.5. Climbout. On all takeoffs, including touch-and-go's, do not initiate a turn until reaching a minimum of 400 feet above ground level (AGL).

3.6. Descent. Do not descend at maximum airspeeds unless mission tactics or training requirements dictate.

3.7. Stall Training:

3.7.1. Accomplish stall training in visual meteorological conditions (VMC) below Flight Level (FL) 400 and at least 5000 feet above the ground or undercast deck. Ensure the stall strips are extended and fuel balance is checked. Recover immediately if any unusual stall characteristics develop.

3.7.2. Stall training will only be accomplished on functional check flight (FCF) training sorties or with a TU-2S qualified instructor pilot (IP) on board.

3.7.3. Intentional stalls from nose high attitudes and accelerated stalls are prohibited.

3.8. Visual Flight Rule (VFR) Patterns:

3.8.1. Closed Patterns. Airspeed during the closed pattern will be no lower than 90 Knots Indicated Air Speed (KIAS) or no-flap T + 10, whichever is higher.

3.8.2. Night VFR Patterns. Night VFR patterns and touch-and-go landings are authorized.

3.9. Low Approaches. Initiate low approach, missed approach, or go-around at 10 feet or above unless performing the landing attitude demonstration in the TU-2S.

3.10. Mobile Officer Control of Landings:

3.10.1. The mobile officer will chase all landings unless safety considerations preclude chase or when conducting mobile officer training from a static position.

3.10.2. Static position mobile officer training should only be accomplished under the following conditions:

3.10.2.1. Day

3.10.2.2. Visibility of 2 statute miles or better

3.10.2.3. Crosswinds <10 knots

3.10.2.4. An IP in the aircraft being monitored

3.10.2.5. The mobile officer must be in a position to clearly view the final approach, touchdown, and rollout/takeoff phases

3.10.3. If the mobile officer will not be chasing the aircraft, has to discontinue chase, or loses sight of the aircraft, inform the pilot by transmitting "Call Sign, Mobile, Negative Chase." This call may include a short explanation, if warranted.

3.11. Touch-and-Go Landings:

3.11.1. All touch-and-go landings will be supervised by an IP (either in the mobile vehicle or in the aircraft).

3.11.2. Minimum runway length for touch-and-go landings is 6,000 feet.

3.11.3. The landing zone for all U-2 landings is the first third of the runway. Initiate the takeoff phase of touch-and-go landings with no less than one-third of the runway remaining.

3.11.4. Do not perform touch-and-go landings with primary mission equipment (PME) on the aircraft. The EWS and line-of-sight data link are not considered PME for the purpose of touch-and-go landings. However, touch-and-go landings should be limited with EWS or data link equipment installed. If PME, EWS, or data link is loaded, aircraft will stop straight ahead on the runway and taxi clear once pogos are installed.

3.12. No-Voice Landings. All landings will be given altitude calls unless the pilot asks for a no-voice landing. No-voice landings are not considered simulated emergency procedures and may be flown on any pattern/ landing with the following restrictions:

3.12.1. Will not be flown with greater than 10 knots of crosswind.

3.12.2. Will not be flown when the runway is snow, slush, or ice covered.

3.12.3. Will not be flown when an emergency exists, or a precautionary landing is being made.

3.12.4. Will not be flown on operational/HHQ sorties.

3.13. Full Stop Landings. Computed landing distance will not exceed 80 percent of the available runway.

3.14. Takeoff and Landing with Arresting Cables. U-2 aircraft may takeoff or land on a runway with arresting gear provided it can be safely accomplished between the barriers.

3.15. Alert Launch Procedures. Alert launch procedures specified in the 1U-2S-1 and 1U-2S-CL-1 are only to be used when real-world operations require an actual alert launch.

3.16. Interfly. Interfly is the exchange and/or substitution of aircrew members and/or aircraft between MAJCOMs to accomplish flying missions. Normally, interfly should be limited to specific operations/tests, exercises, or special circumstances, but may be used to relieve short-term qualified manpower shortfalls. HQ ACC assigned crewmembers may fly with any MAJCOM for the purpose of inspections, evaluations, and training management visits with concurrence from the host MAJCOM.

3.16.1. HQ ACC/A3TV maintains current memoranda of agreements (MOAs) for interfly using ACC-assigned aircraft.

3.16.1.1. Aircraft ownership will not be transferred.

3.16.1.2. The operational squadron will prepare and sign flight orders.

3.16.1.3. As a minimum, crews will be qualified in the aircraft, as well as systems or configuration required to fly the aircraft and/or mission.

3.16.1.4. Crewmember(s) will follow operational procedures defined in this AFI, Air Force Tactics, Techniques and Procedures (AFTTP) 3-1.U-2, *Tactical Employment--U-2* and the applicable technical orders for the Mission Design Series (MDS).

3.16.1.5. Comply with AFI 91-204, *Safety Investigations and Reports*, paragraphs 4.1 and 4.2 for investigation responsibilities.

3.16.2. Approval Authority.

3.16.2.1. With a valid MOA, the group commander or commander of Air Force forces (COMAFFOR) is the approval authority for interfly on ACC aircraft under his/her control.

3.16.2.2. Without a valid/current MOA, HQ ACC/A3TV is the approval authority for interfly on ACC aircraft.

3.16.2.3. Interfly during contingency operations must be approved by both HQ ACC/A3 and respective MAJCOM/A3.

Chapter 4

SIMULATED EMERGENCY PROCEDURES

4.1. General. Simulated emergencies will only be practiced by IPs or under the supervision of an IP in the aircraft or mobile vehicle. Practice simulated emergencies under day VMC (including civil twilight) only (exception: TU-2S sorties with a current and qualified TU-2S IP on board may practice simulated emergencies under day IMC with weather conditions at or above published circling minima for the approach to be flown.)

4.2. Simulated Flameout (SFO) Patterns:

4.2.1. Do not practice SFOs from the initial takeoff leg of the pattern.

4.2.2. Enter all SFOs from a stabilized pitch attitude and power setting.

4.2.3. SFO patterns will be flown from a high or low key point as described in the flight manual, but may begin from other positions at altitudes above those points.

4.3. No-Flap Patterns. Practice no-flap landings without the use of trim (simulating hydraulic pressure loss) are authorized provided the trim setting used is within the normal flight range (one unit nose down to two units nose up).

4.4. Simulated Emergency Pattern Full Stop Landings. If a full stop landing from a simulated emergency pattern is necessary due to training or other requirements, the parameters for a normal full stop landing must be followed (touch-and-go restrictions apply).

Chapter 5

EMERGENCY PROCEDURES

5.1. General. This chapter contains procedures to be followed when emergencies or abnormal conditions occur. They do not supersede or replace flight manual procedures or sound judgment.

5.2. Takeoff Aborts. If hot brakes are experienced or suspected, declare an emergency and do not taxi.

5.3. Hung Pogo Procedures. In the event of a hung pogo, the pilot should declare an emergency, avoid flying over populated areas and avoid making abrupt pitch and power changes. Descend no lower than 1000 feet AGL during attempts to dislodge the pogo. If unable to dislodge the pogo:

5.3.1. With aircraft T-Speed greater than 78.6 KIAS (aircraft greater than 24,300 lb), proceed to the local hung pogo fuel dump area (conditions permitting) and adjust aircraft gross weight as required for landing.

5.3.2. With aircraft T-Speed less than 78.6 KIAS (aircraft less than 24,300 lb), perform a hung pogo landing. After landing, stop straight ahead. If the pogo drops during landing, terminate the emergency, and have the aircraft inspected for damage. If no damage is evident, it is permissible to re-launch using the opposite side pogo or hand launch procedures. If the pogo does not drop, terminate the mission.

5.4. Fuel Restrictions:

5.4.1. Declare **minimum fuel** whenever usable fuel at touchdown will be less than **125 gallons**.

5.4.2. Declare **emergency fuel** whenever usable fuel at touchdown will be less than **50 gallons**.

5.4.3. After landing shut down the engine whenever sump quantity indications become unreliable (usually less than 25 gallons) regardless of fuel depicted on the counter. Do not allow the engine to flame out.

Chapter 6

WEATHER RESTRICTIONS

6.1. Ceiling and Visibility. Fully qualified pilots will comply with AFI 11-202V3 (as supplemented) ceiling and visibility criteria for filing, takeoff, and landing. For student training and interview sorties, comply with syllabus guidance and restrictions.

6.2. Maximum Steady State Surface Wind (Forecasted or Reported). 30 knots for training sorties, due to parachute canopy size and the hazards associated with being dragged. Maximum steady-state surface wind (forecasted or reported) for operational or HHQ directed sorties is 40 knots.

6.3. Crosswinds:

6.3.1. Maximum recommended crosswind component for dry or wet runway operations is 15 knots.

6.3.2. Maximum crosswind component for touch-and-go landings is 12 knots. Exception: On runways less than 300 feet wide, maximum crosswind component for touch-and-go landings is 10 knots.

6.3.3. Maximum crosswind component is 9 knots for operations with loose snow on the runway, and 5 knots for ice on the runway (Runway Condition Reading (RCR) 5).

6.4. Tailwinds:

6.4.1. Maximum tailwind component for takeoffs and full stop landings is 10 knots.

6.4.2. Maximum tailwind component for touch-and-go landings is 5 knots.

6.5. Turbulence. U-2 sorties will not fly into areas of forecast or reported severe turbulence, nor will they remain in areas where actual moderate or higher turbulence is encountered.

6.6. Ice and Snow. Do not perform touch-and-go landings on snow or ice covered runways.

6.7. Space Weather.

6.7.1. The 9 OG/CC is the designated OPR for solar event information impacting worldwide U-2 flying operations. The Beale AFB weather flight (WF) is the 24-hour focal point for integration of solar event intelligence into flying operations and providing alerts regarding solar events issued by the Space Weather Operations Flight (2WS/WXZ).

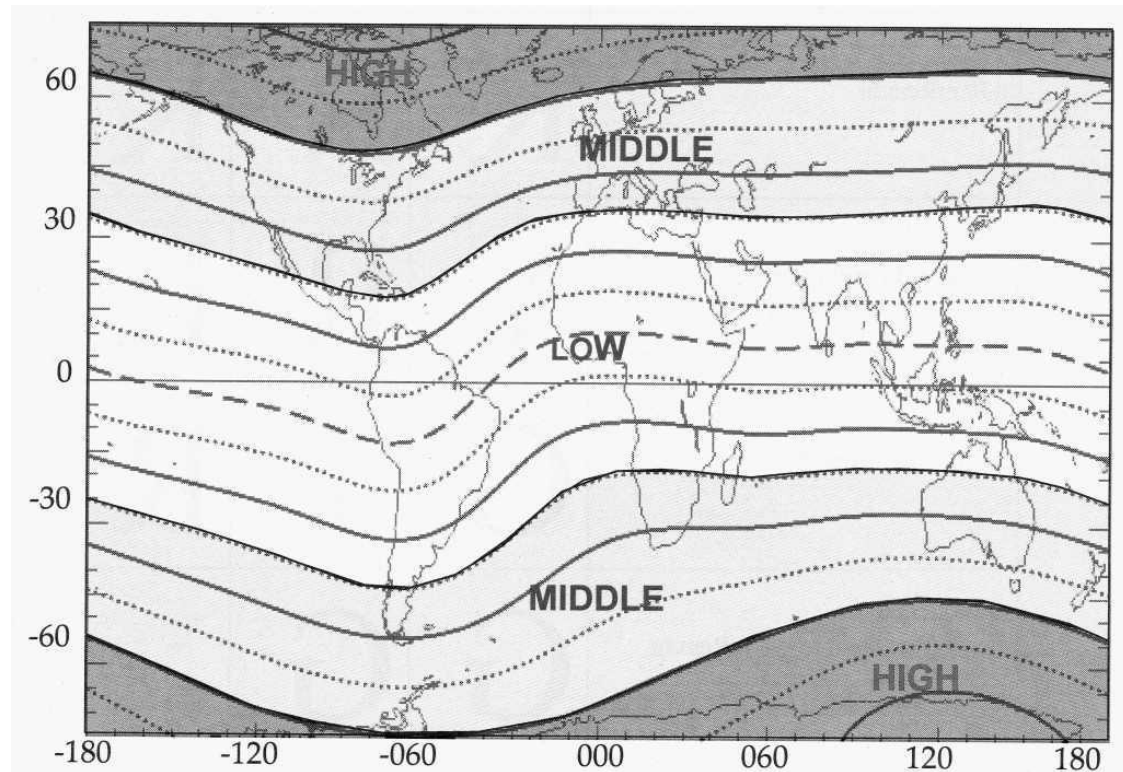
6.7.2. High altitude flight exposes pilots to increased levels of solar radiation, and may potentially expose pilots to significant levels of radiation emanating from coronal mass ejections. Exposure levels are dependent upon three primary factors:

6.7.2.1. Altitude. Exposure levels increase with altitude, given the shielding effect provided by the atmosphere is reduced accordingly.

6.7.2.2. Latitude. Exposure levels increase with latitude, as the atmosphere is thickest in the equatorial region and thinnest near the poles (see Figure 6.1.).

6.7.2.3. Duration. Exposure levels increase time spent aloft.

Figure 6.1. Global Map of Geomagnetic Latitude.



6.7.3. Space Weather Monitoring and Information.

6.7.3.1. Capabilities. The Space Weather Operations Flight (2 WS/WXZ) is co-located with HQ Air Force Weather Agency (AFWA) at Offutt AFB, NE (DSN 312-272-8087), and provides around-the-clock, real-time monitoring of geostationary operational environmental satellite (GOES) data measuring the flux of X-rays and protons generated from major solar flares and other cosmic sources. 2 WS/WXZ utilizes a statistical algorithm combining real-time GOES observations and empirical data to generate estimates of the resultant maximum radiation dosage present in the high altitude environment.

6.7.3.2. Limitations.

6.7.3.2.1. Multiple other variables affect the actual amount of particle energy that reaches the earth's lower atmosphere and impact radiation dosage, but many are not measured operationally for analysis. Examples include the influence of solar winds, interplanetary magnetic fields, and the earth's magnetosphere, as well as the actual properties of each coronal mass ejection. As such, 2 WS/WXZ estimates may only provide a rough order of magnitude of the actual radiation dosage experienced in high altitude flight.

6.7.3.2.2. Given the speed of solar particles, the ability to provide lead times for significant space events which will impact high altitude flight can be extremely limited. While some events may provide several hours of advance notice, the lead time for other events may only be a matter of minutes.

6.7.4. Support to High Altitude Operations.

6.7.4.1. Data Sources. Space weather analysis and forecast products are produced primarily at the Space Weather Operations Center in conjunction with the National Oceanic and Atmospheric Administration (NOAA) Space Weather Prediction Center. These products are available through normal unclassified weather information dissemination systems.

6.7.4.2. Meteorological Watch (METWATCH)/Notification. When a high altitude radiation event occurs:

6.7.4.2.1. 2 WS/WXZ provides automated telephone and e-mail notification to the Beale AFB WF with estimated maximum radiation dosage information for high altitude flights. During periods of limited METWATCH (e.g. Beale AFB airfield closure), 2 WS/WXZ directly notifies the WF commander, WF NCOIC, and weather watch officer via telephone and e-mail.

6.7.4.2.2. The Beale AFB WF posts radiation impacts to the Beale AFB mission weather product (MWP) and provides notification to the 9 OG/CC, 9 MDG/SGP and other select base agencies.

6.7.5. Procedures.

6.7.5.1. 9 OSS/OSW will advise the 9 OG/CC whenever 2 WS/WXZ determines a solar proton event begins or ends, and whenever the estimated maximum radiation dosage for high altitude flights will reach or cross 3, 10 and 30 millirems per hour (mRem/hr).

6.7.5.2. 9 OG/CC will determine impacts to high altitude operations utilizing the guidance from **Table 6.1**, provide immediate notification to squadron or FOL commanders at all affected locations, and provide a recommendation regarding the impact to high altitude flying operations.

6.7.5.3. FOL commanders will work through the designated tasking agency exercising operational control (OPCON) or tactical control (TACON) to determine whether tasked U-2 missions will continue or terminate.

Table 6.1. High Altitude Operations Radiation Exposure Decision Matrix.

AFWA Estimated Maximum High Altitude Radiation	Geomagnetic Latitude (see Figure 6.1.)		
	LOW -30° to 30°	MIDDLE 30° to 60° -30° to -60°	HIGH 60° to 90° -60° to -90°
≥ 30 mRem/hr	Red (Note 1)	Red	Red
≥ 10 to < 30 mRem/hr	Yellow (Note 2)	Red	Red
≥ 3 to < 10 mRem/hr	Green (Note 3)	Yellow	Red

Event Threshold to < 3 mRem/hr	Green	Green	Yellow
Below Event Threshold	Green	Green	Green

NOTES

1. Red: discontinue non-essential high altitude operations (non-essential operations are defined as training, exercises, BUSY RELAY movements and test missions). Consider discontinuing/suspending essential high altitude operations (essential operations are defined as real-world taskings and wartime/contingency support).
2. Yellow: consider discontinuing/suspending non-essential high altitude operations.
3. Green: continue normal operations.

Chapter 7

PHYSIOLOGICAL/CREW REST PROCEDURES

7.1. General. This chapter discusses the special physiological stresses experienced by pilots flying solo, long duration missions in the full pressure suit and outlines crew rest and duty day limitations to reduce physiological stress, mitigate risk and increase safety.

7.2. High Altitude Flights:

7.2.1. Prebreathing. A minimum of 60 minutes prebreathing of 100% oxygen is required for U-2 high altitude flights prior to traffic pattern departure.

7.2.2. Flights During Normal Duty Hours. Pilots will not be scheduled any additional activities for the remainder of the duty period.

7.2.3. Landing After 1930 Local Time. Both the pilot and mobile officer are excused from duty for 13 hours after the actual landing time, or 12 hours after completion of post flight duties, whichever is later.

7.2.4. Mobile Officers. Mobile officers will have a 12-hour duty day. Any crew duty day extension for the pilot applies to the mobile officer and Supervisor of Flying (SOF).

7.2.5. Recovery Period. Adhere to the recovery times (turn times) in Table 7.1. High altitude flight exerts extreme physiological stress on the human body; a flight recovery period is mandated to mitigate the risks of decompression sickness (DCS) and manage fatigue which is induced from repeated, long-duration exposure to the high altitude environment. For waivers to flight recovery periods, consider the pilot's recent duty history, the importance of the mission, and AFI 11-202V3, Chapter 9 restrictions. These limits should not normally be waived for training sorties.

Table 7.1. High Altitude Flight Recovery Period.

HIGH FLIGHT DURATION	TO HIGH FLT	TO LOW FLT
< 2.5 hrs	13 hrs	13 hrs
2.5 hrs to < 6.5 hrs	36 hrs	18 hrs
6.5 to < 9.0 hrs	48 hrs	36 hrs
9.0 hrs or longer	72 hrs (Note 2)	48 hrs
NOTES 1. Times are landing to takeoff, except for high flights < 2.5 hours, for which the 13-hour recovery period is from landing to start of official duties. 2. For high flights of 9.0 hours or longer, the 72-hour flight recovery period may be waived to not less than 48 hours by the wing/CC (waiver authority may be		

delegated, but no lower than the squadron or FOL commander).

7.2.6. Aborted flights of less than 2.5 hours duration may be re-launched with the same pilot. Carefully consider the circumstances of the original abort, the mission to be accomplished, and the condition of the pilot. If a backup pilot is used instead, the original pilot may perform mobile officer duties.

7.2.7. Flights of 9.0 Hours or Longer.

7.2.7.1. The first 24-hr period following landing will be compensatory time off (CTO). At deployed locations, supervisors may perform SOF duties at their discretion, and with squadron or FOL commander approval, if basic AFI 11-418, *Operations Supervision* (as supplemented) crew rest provisions are met.

7.2.7.2. The second 24 hour period will be ground duties only (GDO).

7.3. Low Altitude Flights:

7.3.1. Flight During Normal Duty Hours. Complete the remainder of the normal duty day.

7.3.2. Flights Landing After 1930 Local Time. Both the pilot and mobile officer are excused from duty for 13 hours after the actual landing time, or 12 hours after completion of post flight duties, whichever is later.

7.3.3. Successive Low Flights. A minimum of 3 hours will be scheduled between flights, landing to takeoff (e.g. U-2 to U-2, U-2 to companion trainer, or companion trainer to U-2).

7.4. Crossing Time Zones. All crew members deploying to locations that require crossing more than three time zones must have a minimum of 48 hours at the FOL prior to their first flight to allow circadian rhythm synchronization. This provision may be waived by the 9 OG/CC for BUSY RELAY ferry flights.

7.5. Crew Rest: Commanders will take into account the unique physiological demands associated with solo, extended duration high altitude flight when determining suitability of facilities. Fabric-based billets (e.g. tents) will not be utilized due to noise and occupancy disruptions. Where dining facilities are not available to meet mission timelines, cooking facilities will be available for pre-flight meals.

7.5.1. Crew rest facilities will be single occupancy climate-controlled hard billets at an easily accessible location separated from noise and bright lighting. At deployed locations, accommodations will be inspected by the squadron or FOL commander to determine compliance and suitability.

7.5.2. U-2 pilot high altitude flight preparation must consider availability of a high protein, low residue pre-flight meal. The importance of pre-flight nutrition cannot be over-emphasized because of its possible detrimental impact on the mission. Unit commanders will ensure adequate facilities are available for mission pilot and mobile officer (backup pilot) pre-flight meals.

7.6. Wear of Jewelry. Jewelry, to include watches, will not be worn under the pressure suit.

7.7. Exercise: Avoid heavy exercise for 12 hours after high flights due to increased susceptibility to DCS.

7.8. Aircrew Operations in Chemical, Biological, Radiological and Nuclear Threat Environment. The U-2 is not designed for operations in a Chemical, Biological, Radiological and Nuclear Environment (CBRNE). The full pressure suit is not considered an Aircrew Chemical Defense Ensemble (ACDE) nor does it provide a similar level of protection. Contamination avoidance is the most important defense measure for both the aircraft and the pilot. If contamination is suspected, the pilot should remain on oxygen and process through a Contamination Control Area (CCA) facility. Assistance will be necessary to safely remove the pilot from the pressure suit.

7.9. Deployment Timing.

7.9.1. To decrease the risk of long-term brain injury and neurological DCS, U-2 pilots will normally deploy for periods of 10 weeks or less (waiver authority is 9 RW/CC).

7.9.2. For pilots whose deployment exceeds 10 weeks, squadron or FOL commanders should consider providing recovery periods greater than the durations listed in Table 7.1.

Chapter 8

ORIENTATION FLIGHTS

8.1. General. U-2 orientation flights will be conducted IAW AFI 11-401, *Aviation Management* (as supplemented); this volume; and unit supplements.

8.2. Policy:

8.2.1. Orientation flights will be limited to those individuals who must possess a firsthand knowledge of the U-2 program.

8.2.2. Approval authority for various categories of passengers is defined in AFI 11-401 (as supplemented).

8.3. Responsibilities:

8.3.1. Coordination. HQ ACC/A3T is the single point of contact for coordinating all U-2 orientation flights requiring COMACC or higher approval.

8.3.2. 9 RW/CC. Responsible for hosting orientation recipients as necessary.

8.3.3. 9 OG/CC. Responsible for designing and administering the orientation flight program.

8.4. Mission Profiles. For distinguished visitor (DV) flights, a high mission profile should be planned. For incentive and familiarization flights, a high or low mission profile may be planned, as appropriate.

8.5. Sensitive Information. Certain information about the U-2 platform and sensor capabilities is classified. If appropriate, establish “ground rules” or “rules of engagement” and emphasize this during the orientation. If necessary, a non-disclosure statement will be completed before the flight. 9 RW/PA is the OPR for non-disclosure statements.

Chapter 9

U-2 AIRCRAFT SECURITY

9.1. General. This chapter provides guidance on aircraft security. AFI 31-101, *Air Force Installation Security Program*, and specific MAJCOM security publications contain additional guidance.

9.2. Security.

9.2.1. U-2 aircraft are designated a Protection Level (PL) 3 resource when in CONUS, Alaska or Hawaii.

9.2.2. U-2 aircraft are designated a PL2 resource when:

9.2.2.1. Located OCONUS (excluding Alaska and Hawaii).

9.2.2.2. Sensitive Compartmented Information (SCI) configured.

9.2.2.3. Placed on alert to support OPLAN 8010 tasking.

9.2.2.4. When supporting Reconnaissance in Support of Nuclear Operations (RISNO) tasking.

9.2.3. Aircraft security at non-US military installations is the responsibility of the controlling agency.

9.3. Air Force Installation Security Program. The following security procedures will implement AFI 31-101 requirements for U-2 aircraft:

9.3.1. When designated PL3, the aircraft is parked in an established restricted area and afforded protection IAW AFI 31-101.

9.3.2. When designated PL3 and no permanent or established restricted area parking space is available, establish a temporary restricted area consisting of a raised rope barrier, entry control point, and posted with restricted area signs. Provide security response teams IAW AFI 31-101. Portable security lighting will be provided during the hours of darkness if sufficient permanent lighting is not available.

9.3.3. When designated PL2, the U-2 may be parked inside a permanent restricted area containing PL1 or 2 resources with no additional security measures. If parked within an area containing only PL3 resources or if parked outside a permanent PL2 restricted area, security must be enhanced to meet criteria in AFI 31-101 for temporary PL2 restricted areas.

9.3.4. At non-US military installations, the host base must provide security commensurate with PL2 requirements IAW AFI 31-101. The pilot determines the adequacy of local security capabilities to provide aircraft security. If he determines security to be inadequate, the aircraft will depart to a station where adequate security is available.

9.3.5. The security forces must be given advance notice of all visits to the aircraft.

9.3.6. Security support is a continual requirement and is not negated by the presence of aircrew or ground crewmembers. Security force support terminates only after the aircraft taxis.

9.3.7. Security force personnel are not responsible for securing classified material. This is the responsibility of maintenance and operational personnel IAW AFI 31-101 and AFI 31-401, *Information Security Program*.

9.3.8. All active U-2 pilots are authorized photographic privileges within both PL2 and PL3 restricted areas. Pilots will ensure they comply with all requirements, restrictions, and limitations as published in the Senior Year Program Security Classification Guide (SYPSCG).

9.4. En Route Security:

9.4.1. The planning agency must coordinate with the execution agency to ensure adequate en route security is available.

9.4.2. Unescorted entry is granted to aircrew members and support personnel assigned to the mission who possess their home station AF Form 1199, *USAF Restricted Area Badge*, supported by an Entry Authority List (EAL). Aircrew members and assigned crew chiefs are authorized escort authority. Escort authority must be annotated on the EAL.

9.4.3. Personnel not identified in [paragraph 9.4.2](#) will be escorted within the area.

9.5. Primary Mission Equipment. Secure classified equipment and documents in a properly marked, secured, sensor equipped, and windowless facility or room designated as PL4 or higher. Owner/user personnel control entry into the room using measures commensurate with the PL designation of the area IAW AFI 31-101 and AFI 31-401.

Chapter 10

OPERATIONAL REPORTS AND FORMS

10.1. AF Form 457, USAF Hazard Report. See AFI 91-202, *The US Air Force Mishap Prevention Program*. The Air Force hazard reporting system provides a means for Air Force personnel to alert supervisors and commanders to hazardous conditions requiring prompt corrective action.

10.2. AF Form 651, Hazardous Air Traffic Report (HATR). See AFI 91-202. The Air Force HATR program provides a means for personnel to report all near midair collisions and alleged hazardous air traffic conditions.

10.3. MAJCOM-Approved Form, USAF Aircraft Mishap Report Worksheet (Aircraft and Personnel Mishaps) on which information is provided without the promise of confidentiality IAW AFI 91-204:

10.3.1. Notify the appropriate authorities of any mishap involving aircraft or crew.

10.3.2. Report damage to the aircraft or injury to the crew. Also, report any damage or injury to another organization's equipment or personnel resulting from the movements or actions of an ACC aircraft or crew.

10.3.3. Physiological mishaps.

10.3.4. Engine flameout, failure, or required shutdown, after engine start with intent for flight, regardless of damage.

10.3.5. Loss of thrust sufficient to preclude maintaining level flight at a safe altitude.

10.3.6. Engine case penetration by shrapnel from internal engine component failure.

10.3.7. Engine case rupture or burn-through, engine bay fire, or massive fuel leakage.

10.3.8. Flight control malfunction resulting in an unexpected, hazardous change of flight attitude, altitude, or heading. When making the Air Force Technical Order (AFTO) 781A, *Maintenance Discrepancy and Work Document*, entry, include the flag words "reportable flight control malfunction."

10.3.9. Malfunction of landing gear when difficulty is experienced using emergency system or procedures.

10.3.10. In-flight loss of all pitot-static instrument indications or all gyro-stabilized attitude or directional indications.

10.3.11. Spillage or leakage of radioactive, toxic, corrosive, or flammable material from aircraft that, in the judgment of the reporting individual, is significant hazard to the crew or aircraft (e.g., Hydrazine).

10.3.12. Human factors related situation. Examples include: misinterpretation of instruments, crew overload (tactile, aural, and visual input at a rate too fast to permit reasonable decisions based on the data received), too many actions required in a short period of time, or confusion of controls. Anonymous reports of such situations are acceptable.

10.3.13. All cases of departure from intended takeoff and landing surface onto a surface not designed to normally support takeoff or landing loads.

10.3.14. All in-flight fires regardless of damage.

10.3.15. All bird strikes regardless of damage.

10.3.16. Any occurrence that does not meet the established criteria for a reportable mishap but, in the judgment of the reporting individual, needs to be emphasized in the interest of safety.

10.3.17. Report mishaps as soon as possible to the following offices using the following precedence:

10.3.17.1. MAJCOM flying safety officer (FSO).

10.3.17.2. Any FSO.

10.3.17.3. Nearest command center

10.3.17.4. Base operations. **Note:** In all cases, retain a copy of all relevant information and turn it into a home station safety officer. Keep in mind, that all information provided on a MAJCOM-Approved Form, USAF Aircraft Mishap Report Worksheet is deemed factual and not part of the privileged portion of a mishap safety report. See AFI 91-204.

10.3.18. Complete all appropriate areas of the form. Provide as much detail as possible.

10.4. Reports of Violations. Violations identified in AFI 11-202V3, alleged navigation errors including overwater position errors exceeding 24 nautical miles (NM), border and air traffic control violations will be reported.

10.4.1. Use the following format and include:

10.4.1.1. Factual circumstances

10.4.1.2. Investigation and analysis

10.4.1.3. Findings and conclusions

10.4.1.4. Recommendations

10.4.1.5. Actions taken

10.4.1.6. Attachments to include:

10.4.1.6.1. Notification of incident

10.4.1.6.2. Crew orders

10.4.1.6.3. Statement of crewmembers (if applicable)

10.4.1.6.4. Documenting evidence (logs, charts, etc.)

10.4.2. Send the original investigation report within 45 days to the appropriate MAJCOM.

10.4.3. The following Operations Report (OPREP)-3 reporting procedures for all aircraft notified of navigational errors exceeding 24 NM will be reported under AFMAN 10-206, *Operational Reporting*:

10.4.3.1. The aircraft commander (or agency receiving notification) documents the circumstances surrounding the incident (report content below) and submits an OPREP-3 report. If notification is received while airborne, this report should be submitted at the first point of landing through their command center or request submission through the local host command post. Address record reports to the appropriate MAJCOM, USAF Washington DC/XOORF, and intermediate command levels.

10.4.3.2. Report Content:

10.4.3.2.1. Name and location of unit submitting report.

10.4.3.2.2. Operation nickname or type of occurrence (Type of event state: "Navigation position error").

10.4.3.2.3. Mission identification number.

10.4.3.2.4. For follow-up reports, reference to all previous reports.

10.4.3.2.5. Date, time (Zulu), and location (i.e., Air Route Traffic Control Center (ARTCC) area) of event or incident.

10.4.3.2.6. Analysis of public relations factors involved and estimate of news media reaction.

10.4.3.2.7. Description of all known facts and circumstances. Include aircraft type and tail number, unit (wing or squadron assignment of crew), home base, route of flight, point of alleged deviation, miles off course, any known circumstances concerning the event/incident, and weather conditions at time and place of incident.

10.5. Petroleum, Oil, and Lubricants (POL)—Aviation Fuels Documentation. Procedures are established for correct documentation and processing of forms and invoices, program oversight and personnel responsibilities. Reference AFI 23-202, *Buying Petroleum Product, and Other Supplies and Services Off Station*, MAJCOM specific decentralization procedures, and AFMAN 23-110V1PT3, *Air Force Stock Fund and DPSC Assigned Item Procedures*. Purchase of aviation fuel not complying with this volume may become the financial responsibility of the purchaser.

10.6. MAJCOM-Approved Form, Aircraft Commander's Report on Services and Facilities. Use this form to report that services rendered or conditions encountered were unsatisfactory or detrimental to efficient air mobility operations; services rendered or procedures used are worthy of adoption for all MAJCOM organizations; or a performance rendered by a person (or persons) was commendable and deserves recognition. Attempt to solve problems by contacting appropriate supervisors including the senior commander if conditions and situation warrant. Deliver the completed form to the command post, senior representative or next en route command post.

BURTON M. FIELD, Lt Gen, USAF
DCS, Operations, Plans and Requirements

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

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AFI 10-704, *Military Deception Program*, 30 August 2005

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AFMAN 23-110, *USAF Supply Manual*, 1 April 2009

AFPD 11-4, *Aviation Service*, 01 September 2004

AFTTP 3-1.U-2, *Tactical Employment--U-2*, 21 January 2011

Joint Publication (JP) 1-02, *DOD Dictionary of Military and Associated Terms*, 12 April 2001

Privacy Act of 1974, 5 U.S.C. § 552a

Title 37, United States Code, Section 301.a, 3 January 2007

T.O. 1U-2S-1, *Utility Flight Manual*, 01 June 2012

T.O. 1U-2S-1-1, *Flight Manual*, 1 March 2008

Senior Year Program Security Classification Guide, 31 December 2011

Adopted Forms

AF Form 457, *USAF Hazard Report*

AF Form 651, *Hazardous Air Traffic Report (HATR)*

AF Form 847, *Recommendation for Change of Publication*

AF Form 1199, ***USAF Restricted Area Badge***

Abbreviations and Acronyms

ACC—Air Combat Command

ACCI—Air Combat Command Instruction

ACDE—Aircrew Chemical Defense Ensemble

AF—Air Force

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFRC—Air Force Reserve Command

AFTO—Air Force Technical Order

AFTTP—Air Force Tactics, Techniques, and Procedures

AFWA—Air Force Weather Agency

AGL—Above Ground Level

ANG—Air National Guard

ARTCC—Air Route Traffic Control Center

CARE—Cabin Altitude Reduction Effort
CBRNE—Chemical, Biological, Radiological and Nuclear
CCA—Contamination Control Area
COMAFFOR—Commander of Air Force Forces
CONOPS—Concept of Operations
CONUS—Continental United States
CTO—Compensatory Time Off
DCS—Decompression Sickness
DOD—Department of Defense
DRU—Direct Reporting Unit
DV—Distinguished Visitor
EAL—Entry Authority List
EWS—Electronic Warfare System
FCF—Functional Check Flight
FCIF—Flight Crew Information File
FL—Flight Level
FLIP—Flight Information Publications
FOA—Field Operating Agency
FOL—Forward Operating Location
FSO—Flying Safety Officer
GOES—Geostationary Operational Environmental Satellite
GDO—Ground Duties Only
HATR—Hazardous Air Traffic Report
HHQ—Higher Headquarters
HQ—Headquarters
IAF—Initial Approach Fix
IAW—In Accordance With
INS—Inertial Navigation System
IP—Instructor Pilot
JP—Joint Publication
KIAS—Knots Indicated Airspeed
MAJCOM—Major Command

MDS—Mission Design Series
METWATCH—Meteorological Watch
MOA—Memorandum of Agreement
N/A—Not Applicable
NM—Nautical Miles
NOAA—National Oceanic and Atmospheric Agency
OCONUS—Outside the Continental United States
OG/CC—Operations Group Commander
OPCON—Operational Control
OPLAN—Operations Plan
OPR—Office of Primary Responsibility
OPREP—Operations Report
ORI—Operational Readiness Inspection
ORM—Operational Risk Management
PDM—Programmed Depot Maintenance
PL—Protection Level
PME—Primary Mission Equipment
POL—Petroleum, Oils and Lubricants
RCR—Runway Condition Reading
RISNO—Reconnaissance in Support of Nuclear Operations
SCI—Sensitive Compartmented Information
SFO—Simulated Flameout Pattern
SOF—Supervisor of Flying
TACON—Tactical Control
VFR—Visual Flight Rule
VMC—Visual Meteorological Conditions
WF—Weather Flight

Terms

Administrative Control—Direction or exercise of authority over subordinate or other organizations in respect to administration and support, including organization of Service forces, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, discipline, and other matters not included in the operational missions of the subordinate or other organizations. Also called **ADCON**.

Combatant Command—A unified or specified command with a broad continuing mission under a single commander established and so designated by the President, through the Secretary of Defense and with the advice and assistance of the Chairman of the Joint Chiefs of Staff. Combatant commands typically have geographic or functional responsibilities.

Combatant Command (Command Authority)—Nontransferable command authority established by title 10 ("Armed Forces"), United States Code, section 164, exercised only by commanders of unified or specified combatant commands unless otherwise directed by the President or the Secretary of Defense. Combatant command (command authority) cannot be delegated and is the authority of the combatant commander to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned to the command. Combatant command (command authority) should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and service and/or functional component commanders. Combatant command (command authority) provides full authority to organize and employ commands and forces, as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in combatant command (command authority). Also called **COCOM**.

Execution—Command-level approval for initiation of a mission or portion thereof after due consideration of all pertinent factors. Execution authority is restricted to designated command authority.

Fuel Reserve—Amount of usable fuel carried beyond that required to complete the flight as planned.

HHQ Missions—Missions executed at or above the numbered air force level. HHQ missions include: deployment, redeployment, sensitive reconnaissance operations, ORIs, and PDM input/output. Missions flown in support of flag-level exercises (e.g. RED FLAG-NEVADA) are considered both HHQ and exercise missions.

Mission—Movement of aircraft from a designated point of origin to a designated destination as defined by assigned mission identifier, mission nickname, or both in the schedule, mission directive, OPORD or OPLAN.

Operational Control (DOD)—Command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in combatant command (command authority) and may be delegated within the command. When forces are transferred between combatant commands, the command relationship the gaining commander will exercise (and the losing commander will relinquish) over these forces must be specified by the Secretary of Defense. Operational control is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions and assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Operational control normally provides

full authority to organize commands and forces and to employ those forces as the commander in operational control considers necessary to accomplish assigned missions; it does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. Also called **OPCON**. See also combatant command; combatant command (command authority); tactical control. JP 1-02

Primary Mission Aircraft Inventory (PMAI)—Aircraft authorized for performance of the operational mission. The PMAI forms the basis for allocation of operating resources to include manpower, support equipment, and flying-hour funds. The operating command determines the PMAI required to meet their assigned missions. PMAI also includes test and training requirements.

Squadron Supervisor—Squadron Commander, Operations Officer, Assistant Operations Officers, and selected senior Flight Commanders.

Tactical Control—Command authority over assigned or attached forces or commands, or military capability or forces made available for tasking, that is limited to the detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned. Tactical control is inherent in operational control. Tactical control may be delegated to, and exercised at any level at or below the level of combatant command. Also called **TACON**.